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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/078,020	02/15/2002	Won K. Choi	END920020007US1	4945

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IBM Corporation
IP Law Dept. N50/040-4
1701 North St.
Endicott, NY 13760

EXAMINER	
ZIMMERMAN, JOHN J	
ART UNIT	PAPER NUMBER
1775	

DATE MAILED: 02/11/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

mk

Office Action Summary	Application No.	Applicant(s)	
	10/078,020	CHOI ET AL.	
	Examiner	Art Unit	
	John J. Zimmerman	1775	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 December 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,5,6,9-61,63,64,67-73,75,77 and 80-91* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1,5,6,9,10,29-61,63,64,67-73,75,77 and 83* is/are allowed.

6)☒ Claim(s) *11,13-17,19,21-24,26-28,80,82,84,85,87 and 88* is/are rejected.

7)☒ Claim(s) *12,18,20,25,81,86 and 89-91* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

SECOND OFFICE ACTION

Amendments

1. The Amendment received December 24, 2003 has been entered. Claims 1, 5-6, 9-61, 63-64, 67-73, 75, 77 and 80-91 are pending in this application.

Claim Rejections - 35 USC § 102/103

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.
>
> The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 84-85 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Sakai (U.S. Patent 6,077,477).

5. Sakai discloses a lead-free solder alloy containing 92-97 wt.% Sn, 3.0-6.0 wt.% Ag and 0.1-2.0 wt.% Cu (e.g. see column 2, lines 20-30) along with additions of 5-10 wt.% Bi and 0.1-1.0 wt.% In (e.g. se column 2, lines 31-40; claims 1-4). The compositions of Sakai have endpoints which fall directly in applicant's claimed ranges and examples that approximate and/or point towards applicant's ranges (e.g. see Table 1, embodiment 2) and therefore applicant's composition is taught with sufficient specificity as to anticipate the rejected claims. See MPEP 2131.03. In any event, one of ordinary skill in the art at the time the invention was made would have considered the invention to have been obvious because the alloy proportions taught by Sakai overlap the instantly claimed proportions and therefore are considered to establish a prima facie case of obviousness. It would have been obvious to one of ordinary skill in the art to select any portion of the disclosed ranges including the instantly claimed ranges from the ranges disclosed in the prior art reference, In re Geisler 43 USPQ2d 1365 (Fed. Cir. 1997); In re Woodruff, 16 USPQ2d 1934 (CCPA 1976); In re Malagari, 182 USPQ 549, 553 (CCPA 1974) and MPEP 2144.05. The solder of Sakai is solidified at a temperature gradient of 5°C./sec to

15°C./sec (e.g. see column 2, lines 41-52). The cooling rate of Sakai would meet the conditions of the applicant's claims. Patent and Trademark Office can require applicants to prove that prior art products do not necessarily or inherently possess characteristics of claimed products where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes; burden of proof is on applicants where rejection based on inherency under 35 U.S.C. § 102 or on prima facie obviousness under 35 U.S.C. § 103, jointly or alternatively, and Patent and Trademark Office's inability to manufacture products or to obtain and compare prior art products evidences fairness of this rejection, *In re Best, Bolton, and Shaw*, 195 USPQ 431 (CCPA 1977).

6. Claims 11, 13-15, 17, 19 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Tanaka (Japanese publication 2001-138088).

7. Tanaka discloses a lead-free solder alloy containing Sn, 2.6 wt.% Ag and 0.6 wt.% Cu (e.g. see paragraph [0024]). The silver content in the alloy is low enough to suppress formation of Ag_3Sn plates regardless of the cooling rate. Patent and Trademark Office can require applicants to prove that prior art products do not necessarily or inherently possess characteristics of claimed products where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes; burden of proof is on applicants where rejection based on inherency under 35 U.S.C. § 102 or on prima facie obviousness under 35 U.S.C. § 103, jointly or alternatively, and Patent and Trademark Office's inability to manufacture products or to obtain and compare prior art products evidences fairness of this

rejection, *In re Best, Bolton, and Shaw*, 195 USPQ 431 (CCPA 1977). The amounts of Ag and Cu in the solder are taught by Tanaka with sufficient specificity as to anticipate the rejected claims. See MPEP 2131.03.

8. Claims 80, 82, 84 and 87-88 are rejected under 35 U.S.C. 102(b) as anticipated by Tulman (U.S. Patent 4,806,309).

9. Tulman discloses a solder alloy composition comprising 95% Sn, 3% Sb, 1.5% Bi, 0.5% Ag and also containing 0.0034% Cu (e.g. see column 2, lines 6-29). The silver content in the alloy is low enough to suppress formation of Ag_3Sn plates regardless of the cooling rate. Properties (e.g. lower temperature corresponding to an undercooling relative to the eutectic) must assumed to be inherent to the composition unless proven otherwise. Patent and Trademark Office can require applicants to prove that prior art products do not necessarily or inherently possess characteristics of claimed products where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes; burden of proof is on applicants where rejection based on inherency under 35 U.S.C. § 102 or on prima facie obviousness under 35 U.S.C. § 103, jointly or alternatively, and Patent and Trademark Office's inability to manufacture products or to obtain and compare prior art products evidences fairness of this rejection, *In re Best, Bolton, and Shaw*, 195 USPQ 431 (CCPA 1977).

10. Claims 80, 84 and 87-88 are rejected under 35 U.S.C. 102(a) as anticipated by Takeda (U.S. Patent 6,228,322).

11. Takeda discloses a solder alloy compositions comprising 90% Sn, 7.5% Bi, 2% Ag and 0.5% Cu (e.g. see column 1, lines 56-57) and 93.4% Sn, 2% Ag, 4% Bi, 0.5% Cu and 0.1% Ge (e.g. see column 2, lines 2-3; column 7, lines 5-9). The silver content in the alloy is low enough to suppress formation of Ag_3Sn plates regardless of the cooling rate. Properties (e.g. lower temperature corresponding to an undercooling relative to the eutectic) must assumed to be inherent to the composition unless proven otherwise. Patent and Trademark Office can require applicants to prove that prior art products do not necessarily or inherently possess characteristics of claimed products where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes; burden of proof is on applicants where rejection based on inherency under 35 U.S.C. § 102 or on prima facie obviousness under 35 U.S.C. § 103, jointly or alternatively, and Patent and Trademark Office's inability to manufacture products or to obtain and compare prior art products evidences fairness of this rejection, *In re Best, Bolton, and Shaw*, 195 USPQ 431 (CCPA 1977).

12. Claims 80, 82, 84 and 87-88 are rejected under 35 U.S.C. 102(a) as anticipated by Kusabiraki (U.S. Patent 6,229,248).

13. Kusabiraki discloses solder alloy compositions comprising Sn, Ag and Cu (e.g. see Table 1, Example 13; Table 2, Example 9; Table 4, Example 22) which meet the compositional requirements of the claims. The silver content in the alloy is low enough to suppress formation of Ag_3Sn plates regardless of the cooling rate. Properties (e.g. lower temperature corresponding

to an undercooling relative to the eutectic) must assumed to be inherent to the composition unless proven otherwise. Patent and Trademark Office can require applicants to prove that prior art products do not necessarily or inherently possess characteristics of claimed products where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes; burden of proof is on applicants where rejection based on inherency under 35 U.S.C. § 102 or on prima facie obviousness under 35 U.S.C. § 103, jointly or alternatively, and Patent and Trademark Office's inability to manufacture products or to obtain and compare prior art products evidences fairness of this rejection, *In re Best, Bolton, and Shaw*, 195 USPQ 431 (CCPA 1977).

14. Claims 80, 82, 84 and 87-88 are rejected under 35 U.S.C. 102(b) as anticipated by, or in the alternative under 35 U.S.C. 103 as obvious over Seelig (U.S. Patent 5,405,577).

15. Seelig discloses a solder alloy composition comprising 90.3-99.2% Sn, 0.5-3.5% Ag, 0.1-2.8% Cu and 9.2-2.0% Sb (e.g. see column 4, lines 7-10). The silver content in the alloy is low enough to suppress formation of Ag_3Sn plates regardless of the cooling rate. Properties (e.g. lower temperature corresponding to an undercooling relative to the eutectic) must assumed to be inherent to the composition unless shown otherwise. Patent and Trademark Office can require applicants to prove that prior art products do not necessarily or inherently possess characteristics of claimed products where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes; burden of proof is on applicants where rejection based on inherency under 35 U.S.C. § 102 or on prima facie obviousness under

35 U.S.C. § 103, jointly or alternatively, and Patent and Trademark Office's inability to manufacture products or to obtain and compare prior art products evidences fairness of this rejection, *In re Best, Bolton, and Shaw*, 195 USPQ 431 (CCPA 1977). The compositions of Seelig very closely approximate the majority of applicant's composition range and therefore applicant's composition is taught with sufficient specificity as to anticipate the rejected claims. See MPEP 2131.03. In any event, one of ordinary skill in the art at the time the invention was made would have considered the invention to have been obvious because the alloy proportions taught by Seelig overlap the instantly claimed proportions and therefore are considered to establish a prima facie case of obviousness. It would have been obvious to one of ordinary skill in the art to select any portion of the disclosed ranges including the instantly claimed ranges from the ranges disclosed in the prior art reference, In re Geisler 43 USPQ2d 1365 (Fed. Cir. 1997); In re Woodruff, 16 USPQ2d 1934 (CCPA 1976); In re Malagari, 182 USPQ 549, 553 (CCPA 1974) and MPEP 2144.05.

16. Claims 80, 82, 84 and 87-88 are rejected under 35 U.S.C. 102(b) as anticipated by, or in the alternative under 35 U.S.C. 103 as obvious over Gonya (U.S. Patent 5,393,489).

17. Gonya discloses a solder alloy composition comprising 93.5-94.0% Sn, 2.5-3.0% Ag, 1.0-2.0% Bi, 1.0-2.0% Sb and 1.0% Cu (e.g. see claim 1). The silver content in the alloy is low enough to suppress formation of Ag_3Sn plates regardless of the cooling rate. Properties (e.g. lower temperature corresponding to an undercooling relative to the eutectic) must assumed to be inherent to the composition unless shown otherwise. Patent and Trademark Office can require

applicants to prove that prior art products do not necessarily or inherently possess characteristics of claimed products where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes; burden of proof is on applicants where rejection based on inherency under 35 U.S.C. § 102 or on prima facie obviousness under 35 U.S.C. § 103, jointly or alternatively, and Patent and Trademark Office's inability to manufacture products or to obtain and compare prior art products evidences fairness of this rejection, *In re Best, Bolton, and Shaw*, 195 USPQ 431 (CCPA 1977). The compositions of Gonya very closely approximate the majority of applicant's composition range and therefore applicant's composition is taught with sufficient specificity as to anticipate the rejected claims. See MPEP 2131.03. In any event, one of ordinary skill in the art at the time the invention was made would have considered the invention to have been obvious because the alloy proportions taught by Gonya overlap the instantly claimed proportions and therefore are considered to establish a prima facie case of obviousness. It would have been obvious to one of ordinary skill in the art to select any portion of the disclosed ranges including the instantly claimed ranges from the ranges disclosed in the prior art reference, In re Geisler 43 USPQ2d 1365 (Fed. Cir. 1997); In re Woodruff, 16 USPQ2d 1934 (CCPA 1976); In re Malagari, 182 USPQ 549, 553 (CCPA 1974) and MPEP 2144.05.

18. Claims 80, 82, 84 and 87-88 are rejected under 35 U.S.C. 102(b) as anticipated by, or in the alternative under 35 U.S.C. 103 as obvious over Achari (U.S. Patent 5,863,493).

19. Achari discloses a solder alloy composition comprising 91.5-96.5% Sn, 2-5% Ag, 0-2 Cu and 0.1-2% Ni (e.g. see claim 1). The silver content in the alloy is low enough to suppress formation of Ag_3Sn plates regardless of the cooling rate. Properties (e.g. lower temperature corresponding to an undercooling relative to the eutectic) must assumed to be inherent to the composition unless shown otherwise. Patent and Trademark Office can require applicants to prove that prior art products do not necessarily or inherently possess characteristics of claimed products where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes; burden of proof is on applicants where rejection based on inherency under 35 U.S.C. § 102 or on prima facie obviousness under 35 U.S.C. § 103, jointly or alternatively, and Patent and Trademark Office's inability to manufacture products or to obtain and compare prior art products evidences fairness of this rejection, *In re Best, Bolton, and Shaw*, 195 USPQ 431 (CCPA 1977). The compositions of Achari very closely approximate the majority of applicant's composition range and therefore applicant's composition is taught with sufficient specificity as to anticipate the rejected claims. See MPEP 2131.03. In any event, one of ordinary skill in the art at the time the invention was made would have considered the invention to have been obvious because the alloy proportions taught by Achari overlap the instantly claimed proportions and therefore are considered to establish a prima facie case of obviousness. It would have been obvious to one of ordinary skill in the art to select any portion of the disclosed ranges including the instantly claimed ranges from the ranges disclosed in the prior art reference, In re Geisler 43 USPQ2d 1365 (Fed. Cir. 1997); In re Woodruff, 16 USPQ2d 1934 (CCPA 1976); In re Malagari, 182 USPQ 549, 553 (CCPA 1974) and MPEP 2144.05.

20. Claims 11, 13-17, 21-24, 26-28 and 84-85 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's disclosure of the prior art in view of Sakai (U.S. Patent 6,077,477).

21. Applicant discloses that chip carriers in the prior art may be coupled to a circuit card by a ball grid array comprising BGA solder balls and that lead-free solders are now beginning to be used commercially. Applicant discloses, however, that the lead-free solders have adverse physical characteristics which may cause reliability problems and that there is a need for a reliable lead-free solder for use in solder ball and chip or chip carrier assemblies (e.g. see applicant's specification page 1, lines 6-14). Therefore, there is established a motivation to find an acceptable and reliable lead-free solder for electronic assemblies in the prior art. To this end, Sakai discloses a lead-free solder alloy containing 92-97 wt.% Sn, 3.0-6.0 wt.% Ag and 0.1-2.0 wt.% Cu which is solidified at a temperature gradient of 5°C./sec to 15°C./sec (e.g. see column 2, lines 20-30, 41-52) so that excellent mechanical strength and thermal fatigue resistance can be achieved. The cooling rate of the solder of Sakai would meet the conditions of the applicant's claims. Sakai also discloses compositions including Bi (e.g. see column 4, lines 33-35; claim 1). Sakai also discloses that his invention may be used in electronic circuit boards mounting electronic components (e.g. see column 1, lines 14-23). In view of Sakai's disclosure that his lead-free solder composition has excellent mechanical strength and thermal fatigue resistance suitable for electronic assemblies, it would have been obvious to one of ordinary skill in the art to use Sakai's solder in the admitted prior art chip carriers, circuit cards and ball grid arrays because there is an established motivation to find lead-free solders suitable for electronic

assemblies and the properties of Sakai's lead-free solder meets the requirements of excellent mechanical strength and thermal fatigue resistance that would be recognized by one of ordinary skill in the art as excellent for lead-free solders for use in electronic assemblies (e.g. the admitted prior art chip carriers, circuit cards and ball grid arrays).

22. Regarding the use of applicant's admitted prior art in the rejection, it is axiomatic that consideration of the prior art cited by the examiner must, of necessity, include consideration of the admitted state of the art found in applicant's specification, *In re Davis*, 305 F.2d 501, 134 USPQ 256 (CCPA 1962); *In re Hedges*, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986). Admitted knowledge in the prior art may be used in determining patentability of the claimed subject matter, *In re Nomiya*, 509 F.2d 566, 184 USPQ 607 (CCPA 1975).

23. Regarding whether the solder composition of Sakai meets the conditions of the claims, Patent and Trademark Office can require applicants to prove that prior art products do not necessarily or inherently possess characteristics of claimed products where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes; burden of proof is on applicants where rejection based on inherency under 35 U.S.C. § 102 or on prima facie obviousness under 35 U.S.C. § 103, jointly or alternatively, and Patent and Trademark Office's inability to manufacture products or to obtain and compare prior art products evidences fairness of this rejection, *In re Best, Bolton, and Shaw*, 195 USPQ 431 (CCPA 1977).

24. Claims 11, 13-17, 19 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's disclosure of the prior art in view of Tanaka (Japanese publication 2001-138088).

25. Applicant discloses that chip carriers in the prior art may be coupled to a circuit card by a ball grid array comprising BGA solder balls and that lead-free solders are now beginning to be used commercially. Applicant discloses, however, that the lead-free solders have adverse physical characteristics which may cause reliability problems and that there is a need for a reliable lead-free solder for use in solder ball and chip or chip carrier assemblies (e.g. see applicant's specification page 1, lines 6-14). Therefore, there is established a motivation to find an acceptable and reliable lead-free solder for electronic assemblies in the prior art. To this end, Tanaka discloses a lead-free alloy solder balls containing Sn, 2.6 wt.% Ag and 0.6 wt.% Cu (e.g. see paragraph [0024]) suitable in properties for joining silicon chips and printed circuit boards (e.g. see paragraph [0026]). The silver content in the alloy is low enough to suppress formation of Ag_3Sn plates regardless of the cooling rate. In view of Tanaka's disclosure that his lead-free solder ball composition is suitable for joining chips to printed circuit boards, it would have been obvious to one of ordinary skill in the art to use Tanaka's solder ball compositions in the admitted prior art chip carriers, circuit cards and ball grid arrays because there is an established motivation to find lead-free solders suitable for such electronic assemblies and the properties of Tanaka's lead-free solder balls apparently meets the requirements of lead-free solders for use in electronic assemblies (e.g. the admitted prior art chip carriers, circuit cards and ball grid arrays).

26. Regarding the use of applicant's admitted prior art in the rejection, it is axiomatic that consideration of the prior art cited by the examiner must, of necessity, include consideration of the admitted state of the art found in applicant's specification, *In re Davis*, 305 F.2d 501, 134 USPQ 256 (CCPA 1962); *In re Hedges*, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986). Admitted knowledge in the prior art may be used in determining patentability of the claimed subject matter, *In re Nomiya*, 509 F.2d 566, 184 USPQ 607 (CCPA 1975).

27. Regarding whether the solder composition of Tanaka meets the conditions of the claims, Patent and Trademark Office can require applicants to prove that prior art products do not necessarily or inherently possess characteristics of claimed products where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes; burden of proof is on applicants where rejection based on inherency under 35 U.S.C. § 102 or on prima facie obviousness under 35 U.S.C. § 103, jointly or alternatively, and Patent and Trademark Office's inability to manufacture products or to obtain and compare prior art products evidences fairness of this rejection, *In re Best, Bolton, and Shaw*, 195 USPQ 431 (CCPA 1977).

Allowable Subject Matter

28. Claims 11, 13-17, 19, 21-24, 26-28, 80, 82, 84-85 and 87-88 are rejected. Claims 1, 5-6, 9-10, 29-61, 63-64, 67-73, 75, 77, and 83 are allowed. Claims 12, 18, 20, 25, 81, 86 and 89-91 are objected to as being dependent upon a rejected base claim, but would be allowable if

rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

29. Applicant's arguments filed with the correspondence titled Amendment (received December 24, 2003) have been fully considered but they are not persuasive with regards to the remaining rejections.

30. Applicant's amendments requiring a bismuth content in the alloy of from 0.1% to about 0.2% (e.g. see independent article claims 1, 69) have removed the rejection of the amended claims having this limitation under 35 U.S.C. 102(b) as being anticipated by Sakai (U.S. Patent 6,077,477). The about 1.2 to about 3.0 °C/sec. cooling rate amendment to method claims (e.g. independent method claim 29) has overcome this rejection of these claims. Claims without these limitations are rejected.

31. Applicant's amendments requiring a bismuth content in the alloy of from 0.1% to about 0.2% (e.g. see independent article claims 1, 69) have removed the rejection of the amended claims having this limitation under 35 U.S.C. 102(b) as being anticipated by Tanaka (Japanese publication 2001-138088). The about 1.2 to about 3.0 °C/sec. cooling rate amendment to method claims (e.g. independent method claim 29) has overcome this rejection of these claims. Regarding the remaining claims, applicant argues that Tanaka cannot anticipate claim 11 since Tanaka does not teach the features of providing a first substrate and a first solder ball attached to

a first electrically conductive pad that is coupled to the first substrate and providing a second substrate and a second electrically conductive pad coupled to a second substrate. The examiner does not find this argument convincing because Tanaka clearly discloses using solder balls connecting silicon chips and printed circuit boards (e.g. see paragraph [0026]) and it's understood by one of ordinary skill in this art that these are electrical connections that occur between electrically conductive pads of a chip and a printed circuit board. It must be assumed that one of ordinary skill in the art understands basic principles in this art and thus understands how to interpret the embodiments described in the Tanaka reference. It is not necessary that the Tanaka reference spell out that the chip has electrically conductive pads so that it can contact the electrically conductive pads on the printed circuit board. One of ordinary skill in the art would understand that conductive electrodes (i.e. pads) of the two Tanaka components are electrically conductive or there would be no electrical connection between the electrical components.

32. Regarding the rejections of the claims under 35 U.S.C. 103(a) as being unpatentable over applicant's disclosure of the prior art in view of Sakai or Tanaka, applicant simply argues each reference individually and ignore that the physical structures required by the claims are part of the conventional arrays described by applicant's disclosure of the prior art. As clearly noted in the rejections, applicant discloses that chip carriers in the prior art may be coupled to a circuit card by a ball grid array comprising BGA solder balls and that lead-free solders are now beginning to be used commercially. The examiner supplies clear motivation for one of ordinary skill in the art to combine this disclosure of the prior art with Sakai or Tanaka. Applicant has not presented any concrete arguments refuting any specific motivations presented in the rejection.

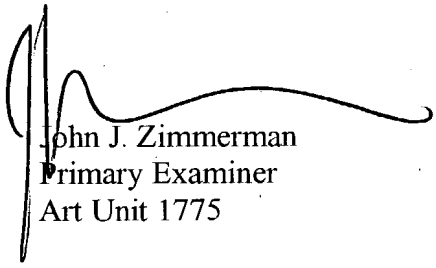
Merely arguing the deficiencies of each reference individually is insufficient where rejections based on combinations have been presented.

Conclusion

33. Applicant's amendment adding claims to a solder composition of a different scope than the originally presented claims necessitated the new ground of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a). A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

34. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John J. Zimmerman whose telephone number is (571) 272-1547. The examiner can normally be reached on 8:30am-5:00pm, M-F. Supervisor Deborah Jones can be reached on (571) 272-1535. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

35. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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Art Unit 1775

jjz
February 6, 2004